

New Satellite Data for SO₂ Suggest Higher Volcanic Mercury Emissions Concentrated in the Northern Hemisphere

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Volcanism is the primary natural source of mercury (Hg) to the biosphere. However, estimates of annual atmospheric releases are uncertain and vary by three orders of magnitude (1 - 1000 Mg a⁻¹). Here, we use sulfur dioxide (SO₂) data from satellite remote sensing products and a synthesis of volcanic Hg:SO₂ measurements to estimate modern annual volcanic Hg emissions and their fate using the GEOS-Chem global atmospheric model. Results confirm passive degassing is the largest source of volcanic Hg during the satellite record. We find the influence of volcanic emissions on atmospheric Hg concentrations are 2 - 3x greater in the extratropical Northern Hemisphere compared to the Southern Hemisphere. Modeling results show that plume injection height exerts an important control on persistence and dispersal of oxidized Hg species. A reconstruction of the natural mercury budget using a global biogeochemical box model suggests the atmospheric Hg reservoir prior to human influence was 500 Mg, which is 80 - 90% lower than present.